PART 2 —
BEST MANAGEMENT PRACTICES

This page intentionally left blank.

PART 2 — BEST MANAGEMENT PRACTICES

TABLE OF CONTENTS

BMPs Continued

PROCESSES AND PRINCIPLES OF EROSION AND SEDIMENTATION

Soil disturbance, whether by natural forces or by construction and maintenance activities, can accelerate the rate of erosion. Careful planning combined with proper selection and installation of erosion control measures can reduce the impact of construction and maintenance related erosion.

SOIL EROSION PROCESS

- Splash erosion results when raindrops fall on bare or sparsely vegetated soil and detach the soil particles.
- Sheet erosion occurs when these soil particles are transported in a thin layer, or sheet, by flowing water.
- Rills and gullies are formed by concentrated, high velocity sheet flow. More soil detaches, increasing the erosion damage.
- Stream and channel erosion occurs by even higher rates of velocity and steepness of slope.
- Wind erosion occurs during dry weather conditions and high winds. Size of particles being moved is related to wind velocity. Particles moved by wind may cause air pollution, soil loss and/or water quality degradation.

Water quality and fish habitat are the major concerns associated with soil movement. BMPs combined with training and oversight will enable road maintenance personnel to lessen the effects of soil erosion from the work site.

PRINCIPLES OF EROSION AND SEDIMENTATION CONTROL

Effective erosion and sedimentation control requires first that the soil surface be protected from the erosive forces of wind, rain, and runoff, and second that eroded soil is controlled onsite. The following principles shall be integrated into a system of control measures and management techniques to control erosion and reduce offsite sediment migration.

Minimize the Extent and Duration of Exposure

Scheduling can be a very effective means of reducing the hazards of erosion. Schedule construction activities to minimize the exposed area and the duration of exposure. Maintenance activities can not always be scheduled, it is important to stabilize disturbed areas as quickly as possible in scheduled or unscheduled maintenance.

Protect Areas to be Distrubed from Stormwater Runoff

Use berms, diversions, pumps, dams, barriers and constructed waterways to intercept runoff and divert it away from cut-and-fill slopes or other disturbed areas. Install these measures before beginning maintenance activities.

Stabilize Disturbed Areas

Removing the vegetative cover and altering the soil structure by clearing the surface may increase an area's susceptibility to erosion. Apply stabilizing measures after the land is disturbed and implement temporary or permanent vegetation, mulches, or other BMP's to correspond with maintenance activities. During the winter season, October through June, no soils shall remain exposed and unworked for more than 2 days. During the summer season, July through September, no soils shall remain exposed and unworked for more than 7 days. This condition applies to all soils on site, whether at final grade or not.

Mimimize Runoff Velocities

Clearing existing vegetation may reduce the surface roughness and infiltration rate, thereby increasing runoff velocities and volumes. Use measures that break the slopes to reduce the problems associated with concentrated flow volumes and runoff velocities.

Retain Sediment on the Site

Even with careful planning, some erosion is unavoidable. The resulting sediment can be reduced by BMPs that control on the site. Plan the location where sediment deposition will occur and maintain access for maintenance cleanout. Whenever possible, plan and construct sediment trap and basin BMPs before other land-disturbing activities.

Inspect and Maintain BMPs

Inspection and maintenance of BMPs is vital to the performance of erosion and sedimentation BMPs. It is essential to inspect all BMPs to determine that they are working properly and to ensure that problems are corrected as they are detected.

Planning and Selection
Sample Checklist #1

Figure 14

ACTIVITY INFORMATION	
Location:	Maintenance Activity:
Lead:	Date:
Description of Activity:	

CHECKLIST		
Steps	**Completed**	**Comments**
1. Make site visit before starting work.		
2. Define activity, scope and limits.		
3. Identify sensitive areas and drainage features.		
4. Is environmental staff required to review plans or provide crew support?		
5. Are fish present (or likely to be present) in work area or activity impact area. (If yes, contact environmental support staff or WSDFW.)		
6. Will fish exclusion be required? (If yes, coordinate with designated staff or agency.)		
7. Review Maintenance Category BMP options related to site-specific conditions.		
8. Select applicable BMPs from Part 1 and 2 of the *Guidelines.*		
9. Secure permits.		
10. Read and understand all permit conditions. Resolve permit conditions before moving forward.		
11. Prepare construction/maintenance schedule, and/or sequence (Including installing, monitoring, maintaining, and removing BMP(s).)		
12. Schedule a pre-maintenance or pre-construction meeting as necessary.		
13. Review activity as possible model for training and/or adaptive management discussions.		

ACTIVITY AND BMP

Pre-construction and Pre-maintenance Meeting Sample Checklist #2

Figure 15

ACTIVITY INFORMATION	
Location:	Maintenance Activity:
Lead:	Date:
Description of Activity:	

CHECKLIST		
Steps	**Completed**	**Comments**
1. Invite appropriate personnel and/or agencies.		
2. Prepare agenda and attendance/sign-in form.		
3. Outline construction/maintenance, schedule, and/or sequence (Including installation, monitoring, maintaining, & removing BMP(s)).		
4. Identify sensitive areas and drainage features.		
5. If fish exclusion required, follow Fish Exclusion Protocol in Appendix E.		
6. Clarify roles & responsibilities of all personnel & agencies related to all aspects of the activity.		
7. Discuss permits, approvals and their conditions.		
8. If environmental staff is required to be onsite during work activities: introduce personnel and their role(s).		

ACTIVITY AND BMP

Installation, Monitoring, Maintianing and Removal Sample Checklist #3

Figure 16

ACTIVITY INFORMATION	
Location:	Maintenance Activity:
Lead:	Date:
Description of Activity:	

CHECKLIST		
Steps	**Completed**	**Comments**
1. Identify/mark work area and location of BMP(s).		
2. Arrange for delivery of BMP(s) products.		
3. Environmental staff support as appropriate.		
4. Make sure BMP(s) are installed in accordance with the *Guidelines*, permit conditions and/or specifications.		
5. Monitor/check BMP(s) routinely to make sure BMP outcomes are achieved, and make repairs, adjustments, and/or additions as necessary.		
6. Remove BMP(s) and re-vegetate in accordance with the *Guidelines*.		

OUTCOME CATEGORY:
KEEP WATER FROM WORK AREA

Definition: The BMPs in this category are used to keep water from reaching the work area or disturbed soils generally by means of a by-pass, diversion or interception process.

Desired Outcome: The desired outcome of these BMPs is to by-pass or divert sheet flow, storwater or stream flow around or through the work area. The intercepted water will be discharged to an acceptable storm drainage system or outfall.

Applications: These BMPs work well:

- In streams or ditches where the normal flow can be piped around the work area by temporarily damming and conveying the flow by pumping or gravity. (HPA)
- Covering stock piles or disturbed soils with impermeable fabric to intercept rainfall. Sheet flows shall be collected and diverted at the bottom of the covering.
- Diverting sheet flow around work area or disturbed soils by constructing upslope berms or channels.

Limitations: These BMPs are often used in combination with other BMPs (i.e., dewatering work area, grass-lined swales). Refer to *individual* (Part 2) BMP limitations.

Permit Conditions: Follow acceptable procedures, if required in HPA, to exclude fish from work area. Reintroduce water flow into the work area to reduce sediment transport. Comply with permit requirements. Inspect and maintain BMPs according to these Guidelines.

BMP Options (include but not limited to):

- Aqua Barrier.
- Coffer Dam.
- Dewatering.
- Diversion Berm.
- Diversion Channel.
- Plastic Covering.
- Sandbag.
- Stream Bypass.
- Vactoring.

OUTCOME CATEGORY:
Reduce Potential for Soil from Becoming Water- or Airborne

Definition: The BMPs in this category work to keep soil particles in disturbed areas from becoming water or air borne.

Desired Outcome: The desired outcome of these BMPs is to reduce erosion by reducing soil particles from becoming water or air borne.

Application: These BMPs work well to stabilize:

- Slopes.
- Soils.
- Roadways.
- Channels.

Limitations: Often used in combination with other BMPs allowing the disturbed area to stabilize. Refer to individual BMP (Part 2) limitations.

Permit Conditions: Comply with permit requirements. Inspect and maintain BMPs according to these guidelines.

BMP Options (Include but not limited to):

- Back of Slope Planting.
- Construction Access Road.
- Ditch Lining.
- Dust Control.
- Filter Fabric.
- Grass Lined Channel.
- Hand Seeding.
- Hydroseeding.
- Live Staking.
- Mulching.
- Plastic Covering.
- Soil Stabilization (Blankets/Matting).
- Surface Roughening.
- Sweeping.
- Vegetative Buffer.

OUTCOME CATEGORY:
FILTER/PERIMETER PROTECTION

Definition: The BMPs in this category reduce erosion and sedimentation of soil particles/contaminants as the water passes through a filtering device. This outcome will also apply to perimeter protection around the job site.

Desired Outcome: The desired outcome of these BMPs is to reduce soil particles/contaminants before the water discharges from the job site.

Application: These BMPs work well:

- When the rate of flow is relatively low and the filter can be inspected and maintained to ensure the BMP continues to function.
- Perimeter protection around job site.

Limitations: Not effective in high flows or for removal of high percentage of fine-grained materials. Refer to individual BMP (Part 2) limitations.

Permit Conditions: Comply with permit requirements. Inspect and maintain BMPs according to these guidelines.

BMP Options (include but not limited to):

- Coir Log.
- Continuous Berm.
- Curb Inlet Sediment Trap.
- Excelsior Filled Log.
- Filter Fabric.
- Grass Lined Channel.
- Gravel Filled Sump.
- Half Round Filter.
- Inlet Protection.
- Kimble Filter Pipe.
- Silt Fence.
- Silt Mat.
- Straw Bale Barrier (1).
- Straw Bale Barrier (2).
- Straw Bale Barrier (3).
- Straw Log.
- Washed Rock.

OUTCOME CATEGORY:
SETTLING

Definition: The BMPs in this category allow particles/contaminants to settle as the water velocity decreases.

Desired Outcome: The desired outcome of these BMPs is to allow sediment to settle out of the water. This will reduce soil particles/contaminants from leaving the job site.

Application: These BMPs work well:

- When the rate of flow is relatively low.
- When there is sufficient space or volume to properly size a settling BMP.

Limitations: Not effective in high flows or for removal of high percentage of fine-grained materials. Refer to individual BMP (Part 2) limitations.

Permit Conditions: Comply with permit requirements. Inspect and maintain BMPs according to these guidelines.

BMP Options (include but not limited to):

- Coir Log.
- Continuous Berm.
- Curb Inlet Sediment Trap.
- Excelsior Filled Log.
- Filter Fabric.
- Rock Check Dam.
- Sandbag.
- Sedimentation Sump.
- Silt Fence.
- Silt Mat.
- Siltation Pond/Tank.
- Straw Bale Barrier (1).
- Straw Bale Barrier (2).
- Straw Bale Barrier (3).
- Straw Log.
- Temporary Sediment Trap.
- Triangular Silt Dike.
- Turbidity Curtain.

OUTCOME CATEGORY:
REDUCE WATER VELOCITY/EROSIVE FROCES

Definition: The BMPs in this category reduce or diminish the water velocity, thereby dissipating its erosive force.

Desired Outcome: The desired outcome of these BMPs is to create energy dissipation and reduce erosion.

Application: These BMPs work well:

- On stream and ditch banks.
- In swales/grass lined channels.
- In waterbodies.
- On slopes.
- On large disturbed areas.

Limitations: These BMPs should not be used when maintenance activities are conducted in locations that could reduce actual or potential high flow salmonid refuge functions. These BMPs may be used if required by permit conditions. Refer to individual BMP (Part 2) limitations.

Permit Conditions: Comply with permit requirements. Inspect and maintain BMPs according to these guidelines.

BMP Options (include but not limited to):

- Back of Slope Planting.
- Coir Fabric.
- Coir Log.
- Continuous Berm.
- Ditch Lining.
- Excelsior Filled Log.
- Hand Seeding.
- Hydroseeding.
- Large Woody Debris.
- Live Staking.
- Mulching.
- Rip Rap.
- Rock Check Dam.
- Sandbag.
- Silt Fence.
- Silt Mat.
- Straw Bale Barrier (1).
- Straw Bale Barrier (2).
- Straw Bale Barrier (3).
- Straw Log.
- Stream Bank Bio-Engineering.
- Surface Roughening.
- Triangular Silt Dike.
- Turbidity Curtain.
- Vegetative Buffer.

OUTCOME CATEGORY:
CONTAINMENT

Definition: The BMPs in this category retain water and soil particles/ contaminants on the work site.

Desired Outcome: The desired outcome of these BMPs is to reduce water discharge from the job site.

Application: These BMPs work well:

- In enclosed drainage systems.
- In swales.
- In open drainage systems.
- In waterbodies. (bridge maintenance etc)

Limitations: These BMPs should not be used when maintenance activities are conducted in locations that could reduce actual or potential high flow salmonid refuge functions. These BMPs may be used if required by permit conditions. Refer to individual BMP (Part 2) limitations.

Permit Conditions: Comply with permit requirements. Inspect and maintain BMPs according to these guidelines.

BMP Options (include but not limited to):

- Concrete Containment (1).
- Concrete Containment (2).
- Vactoring.

OUTCOME CATEGORY:
HABITAT PROTECTION/MAINTENANCE

Definition: The BMPs in this category maintain or protect habitat.

Desired Outcome: The desired outcome of these BMPs is to maintain or protect habitat by providing:

- Bank/slope stabilization.
- Spawning/rearing areas.
- Habitat shading.
- Reducing erosion by providing ground cover, binding soil particles with roots, and lowering water velocity.
- Habitat for primary production.
- Habitat for prey base organisms such as macro-invertebrates.

Application: These BMPs work well in:

- Riparian areas.
- Sensitive areas.
- Watercourses and streams.

Limitations: These BMPs should be done in accordance with project design. Refer to individual BMP (Part 2) limitations.

Permit Conditions: Comply with permit requirements. Inspect and maintain BMPs according to these guidelines.

BMP Options (include but not limited to):

- Coir Fabric.
- Coir Log.
- Excelsior Filled Log.
- Hand Seeding.
- Hydroseeding.
- Large Woody Debris.
- Live Staking.
- Streambed Gravel.

OUTCOME CATEGORY:
REDUCE POTENTIAL FOR CONTAMINANTS FALLING INTO WATER

Definition: The BMPs in this category reduce the potential for the contaminants from the work area from entering the water. This outcome can be achieved by capturing falling particles from bridge or other over-water work.

Desired Outcome: The desired outcome of these BMPs is to reduce contaminants from entering the water.

Application: These BMPs work well:

- On bridge or pipeline maintenance projects.

Limitations: Refer to individual BMP (Part 2) limitations.

Permit Conditions: When used in watercourses or streams, these BMPs must be used in accordance with permit requirements. Inspect and maintain BMPs according to these guidelines.

BMP Options (include but not limited to):

- Diaper Netting.
- Plywood Work Platform.

BMP Outcome Category Matrix

Figure 13

= Recommended BMP Application but not limited to

BMP	PAGE	BMP OUTCOME CATEGORY							
		Keep Water From Work Area	Reduce Potential for Soil from Becoming Water– or Airborne	Filter / Perimeter Protection	Settling	Reduce Water Velocity / Erosive Forces	Containment	Habitat Protection / Maintenance	Reduce Potential for Contaminants Falling Into Water
AQUA BARRIER	2.20	●							
BACK OF SLOPE PLANTING	2.23		●			●			
COFFERDAM	2.25	●							
COIR FABRIC	2.28					●		●	
COIR LOG	2.30			●	●	●		●	
CONCRETE CONTAINMENT (1)	2.33						●		
CONCRETE CONTAINMENT (2)	2.36						●		
CONSTRUCTION ACCESS ROAD	2.38		●						
CONTINUOUS BERM	2.41			●	●	●			
CURB INLET SEDIMENT TRAP	2.44			●	●				
DEWATERING	2.49	●							
DIAPER NETTING	2.51								●
DITCH LINING	2.53		●			●			
DIVERSION BERM	2.55	●							
DIVERSION CHANNEL	2.57	●							
DUST CONTROL	2.60		●						
EXCELSIOR FILLED LOG	2.62			●	●	●		●	
FILTER FABRIC	2.64		●	●	●				
GRASS LINED CHANNEL	2.66		●			●			
GRAVEL FILLED SUMP	2.70			●					
HALF ROUND FILTER	2.71			●					
HAND SEEDING	2.73		●			●		●	
HYDROSEEDING	2.75		●			●		●	
INLET PROTECTION	2.77			●					
KIMBLE FILTER PIPE	2.84			●					
LARGE WOODY DEBRIS	2.86					●		●	
LIVE STAKING	2.91		●			●		●	
MULCHING	2.95		●			●			
PLASTIC COVERING	2.97	●	●						
PLYWOOD WORK PLATFORM	2.99								●

BMP Outcome Category Matrix

Figure 13 Continued

= Recommended BMP Application but not limited to

BMP	PAGE	BMP OUTCOME CATEGORY: Keep Water From Work Area	Reduce Potential for Soil from Becoming Water– or Airborne	Filter / Perimeter Protection	Settling	Reduce Water Velocity / Erosive Forces	Containment	Habitat Protection / Maintenance	Reduce Potential for Contaminants Falling Into Water
RIP RAP	2.101					●			
ROCK CHECK DAM	2.103				●	●			
SANDBAG	2.107	●			●	●			
SEDIMENTATION SUMP	2.111				●				
SILT FENCE	2.112			●	●	●			
SILT MAT	2.115			●	●	●			
SILTATION POND/SETTLING TANK	2.117				●				
SOIL STABILIZATION (Blankets/Matting)	2.120		●						
STRAW BALE BARRIER (1)	2.125			●	●	●			
STRAW BALE BARRIER (2)	2.128			●	●	●			
STRAW BALE BARRIER (3)	2.133			●	●	●			
STRAW LOG	2.136			●	●	●			
STREAM BANK STABILIZATION	2.139					●			
STREAM BYPASS	2.140	●							
STREAMBED GRAVEL	2.144							●	
SURFACE ROUGHENING	2.146		●			●			
SWEEPING	2.150		●						
TEMPORARY SEDIMENT TRAP	2.153				●				
TRIANGULAR SILT DIKE	2.156				●	●			
TURBIDITY CURTAIN	2.160				●	●			
VACTORING	2.164	●					●		
VEGETATIVE BUFFER	2.166		●			●			
WASHED ROCK	2.168			●					